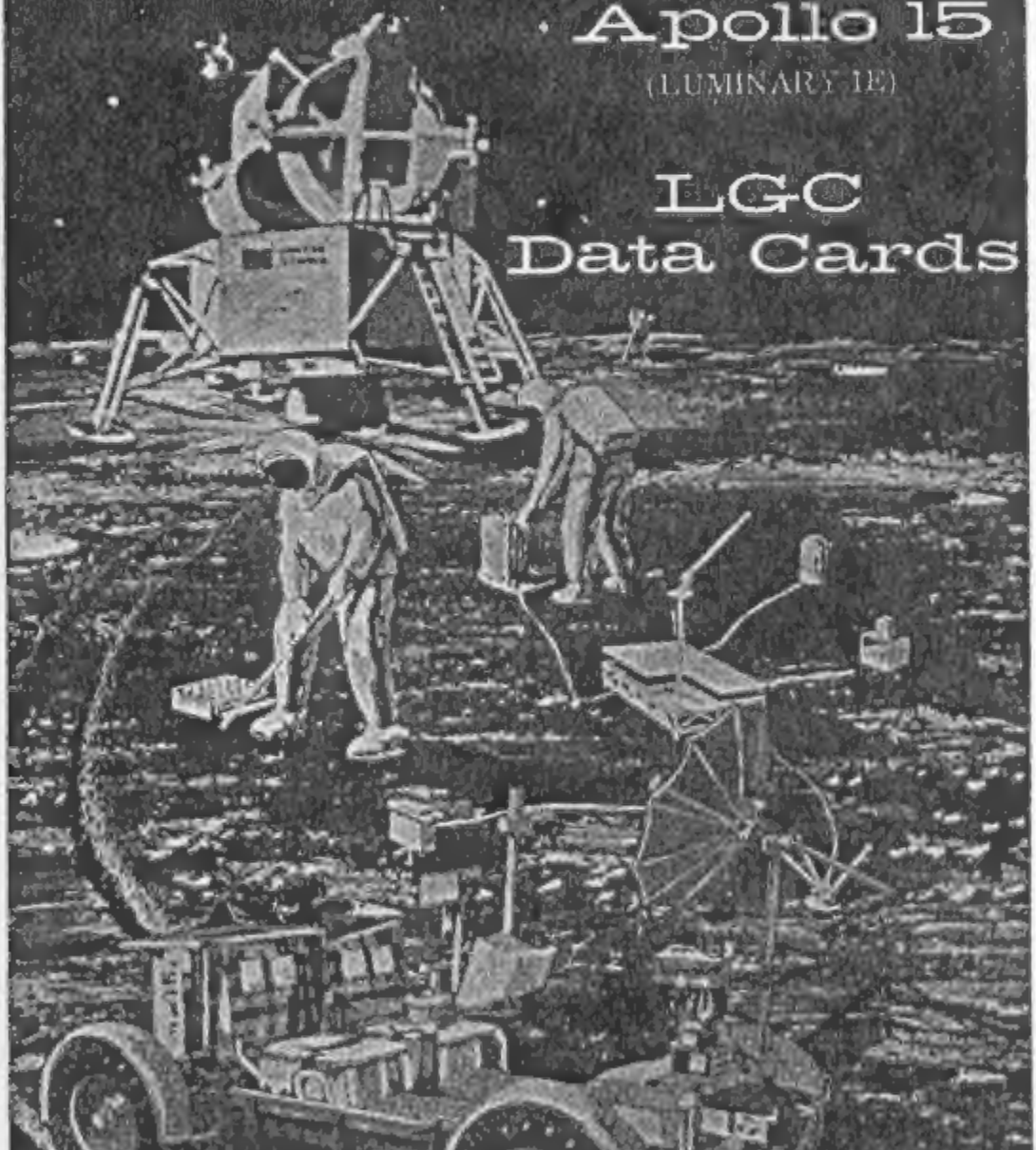
Apollo GUIDANCE AND NAVIGATION

Apollo 15

(LUMINARY 1E)

LGC Data Cards



DELCO ELECTRONICS
DIVISION OF GENERAL MOTORS CORPORATION
MILWAUKEE, WISCONSIN 53201

FOR TRAINING USE ONLY

APRIL 1971

BLOCK II BASIC INSTRUCTIONS

INSTRUCTION	ORDER CODE	DESCRIPTION
AD K	06.	ADD K
ADS E	02.6	ADD TO STORAGE E
AUG E	12.4	AUGMENT E
BZF F	11.2 11.4 11.6	BRANCH ON ZERO TO FIXED F
BZMF F	16.2 16.4 16.6	BRANCH ON ZERO OR MINUS TO FIXED F
CA K	03.	CLEAR AND ADD K
CAE E	03.	CLEAR AND ADD E
CAF F	03.	CLEAR AND ADD F
CCS E	01.0	COUNT, COMPARE, AND SKIP ON E
COM	04.0000	COMPLEMENT A
CS K	04.	CLEAR AND SUBTRACT K
CYL	.0022	CYCLE LEFT
CYR	.0020	CYCLE RIGHT
DAS E	02.0	DOUBLE ADD TO STORAGE E
DCA K	13.	DOUBLE CLEAR AND ADD K
DCS K	14.	DOUBLE CLEAR AND SUBTRACT K
DCOM	14.0001	DP COMPLEMENT A, L
DDOUBL	02.0001	DP DOUBLE A, L
DIM E	12.6	DIMINISH E
DOUBLE	06.0000	DOUBLE A
DTCB	05.2000	DP TRANSFER CONTROL BOTH BANKS
DV E	11.6	DIVIDE BY E
DXCH E	05.2	DOUBLE EXCHANGE A, L WITH E, E + 1
EDOP	.0023	EDIT OPERAND
EXTEND	0.0006	EXTEND
INCR E	02.4	INCREMENT E
INDEX E	05.0	INDEX NEXT BASIC INSTRUCTION WITH E
INDEX K	15.	INDEX NEXT EXTRA-CODE INSTRUCTION WITH K
INHINT	00.0004	INHIBIT INTERRUPT
LXCH E	02.2	EXCHANGE L AND E
MASK K	07.	MASK WITH K
MP K	17.	MULTIPLY K
MSU E	12.0	MODULAR SUBTRACT E
NOOP	03.0000	NO OPERATION (E)
NOOP	TCF 1+1	NO OPERATION (F)
OVSK	05.4000	OVERFLOW SKIP; TS A
QXCH E	12.2	EXCHANGE Q AND E
RAND H	10.3	READ AND "AND" H
READ H	10.0	READ H
RELINT	00.0003	RELEASE INHIBIT INTERRUPT
RESUME	05.0017	RESUME INTERRUPTED PROGRAM
RETURN	00.0002	RETURN; TCQ
ROR H	10.4	READ AND "OR" H
RXOR H	10.6	READ AND EXCLUSIVE "OR" H
SR	.0021	SHIFT RIGHT
SU E	16.0	SUBTRACT E
TCAA	05.4003	TRANSFER CONTROL TO ADDRESS IN A; TS Z
TC K	00.	TRANSFER CONTROL TO K
TCF F	01.2 01.4 01.6	TRANSFER CONTROL TO FIXED F
TS E	05.4	TRANSFER TO STORAGE E
WAND H	10.3	WRITE AND "AND" H
WOR H	10.5	WRITE AND "OR" H
WRITE H	10.1	WRITE H
XCH E	05.6	EXCHANGE A AND E
ZL	02.2007	ZERO L; LXCH ZERO
ZQ	13.2007	ZERO Q; QXCH ZERO

VERB CODES

00
01 DISPLAY OCTAL COMP 1 IN R1
02 DISPLAY OCTAL COMP 2 IN R2
03 DISPLAY OCTAL COMP 3 IN R3
04 DISPLAY OCTAL COMP 1,2 IN R1, R2
05 DISPLAY OCTAL COMP 1,2,3, IN R1, R2, R3
06 DISPLAY DECIMAL (R1 OR R1, R2 OR R1, R2, R3)
07 DISPLAY DP DECIMAL (R1, R2) (TESTS ONLY)
08
09
10
11 MONITOR OCTAL COMP 1 IN R1
12 MONITOR OCTAL COMP 2 IN R2
13 MONITOR OCTAL COMP 3 IN R3
14 MONITOR OCTAL COMP 1, 2 IN R1, R2
15 MONITOR OCTAL COMP 1, 2, 3 IN R1, R2, R3
16 MONITOR DECIMAL IN R1 OR R1, R2 OR R1, R2, R3
17 MONITOR DP DECIMAL (R1, R2) (TEST ONLY)
18
19
20
21 LOAD COMPONENT 1 INTO R1
22 LOAD COMPONENT 2 INTO R2
23 LOAD COMPONENT 3 INTO R3
24 LOAD COMPONENT 1, 2 INTO R1, R2
25 LOAD COMPONENT 1, 2, 3 INTO R1, R2, R3
26
27 DISPLAY FIXED MEMORY
28
29
30 REQUEST EXECUTIVE
31 REQUEST WAITLIST
32 RECYCLE PROGRAM
33 PROCEED WITHOUT DSKY INPUTS
34 TERMINATE FUNCTION
35 TEST LIGHTS
36 REQUEST FRESH START
37 CHANGE PROGRAM (MAJOR MODE)
38
39
40 ZERO CDU-S (SPECIFY N20 OR N78)
41 COARSE ALIGN CDU (SPECIFY N20 OR N78)
42 FINE ALIGN IMU
43 LOAD IMU ATT ERROR METERS
44 TERMINATE RR CONTINUOUS DESIGNATE (V41N72 OPTION 3)
45
46
47 INITIALIZE AGS (R47)
48 REQUEST DAP DATA LOAD ROUTINE (R03)
49 REQUEST CREW DEFINED MANEUVER ROUTINE (R62)
50 PLEASE PERFORM
51
52 MARK X-RETICLE
53 MARK Y-RETICLE
54 MARK X OR Y-RETICLE
55 INCREMENT LOC TIME (DECIMAL)
56 TERMINATE TRACKING (P20-P25)
57 PERMIT LANDING RADAR UPDATES
58 INHIBIT LANDING RADAR UPDATES
59 COMMAND LR TO POSITION 2
60 DISPLAY VEHICLE ATTITUDE RATES (FDAI)
61 DISPLAY DAP FOLLOWING ATTITUDE ERRORS (FDAI)
62 DISPLAY TOTAL ATTITUDE ERRORS WITH RESPECT TO NOUN 22 (FDAI)
63 SAMPLE RADAR ONCE PER SECOND (R04)
64 REQUEST S-BAND ANTENNA ROUTINE (R38)
65 SET FLAG TO DISABLE U, V JETS DURING DPS BURNS
66 VEHICLES ARE ATTACHED. MOVE THIS VEHICLE STATE VECTOR TO OTHER VEHICLE STATE VECTOR
67 DISPLAY W MATRIX
68 DISABLE TERRAIN MODEL
69 CAUSE RESTART
70 UPDATE LIFTOFF TIME (P27)
71 UNIVERSAL UPDATE-BLOCK ADR (P27)
72 UNIVERSAL UPDATE-SINGLE ADR (P27)
73 UPDATE LGC TIME (OCTAL) (P27)
74 INITIALIZE ERASABLE DUMP VIA DOWNLINK (V74)
75 ENABLE U AND V JET FIRINGS DURING DPS BURNS
76 MINIMUM IMPULSE COMMAND MODE (DAP)
77 RATE COMMAND AND ATTITUDE HOLD MODE (DAP)
78 LR SPURIOUS RETURN TEST START (R77)
79 LR SPURIOUS RETURN TEST STOP (R77)
80 UPDATE LEM STATE VECTOR
81 UPDATE CSM STATE VECTOR
82 REQUEST ORBIT PARAM DISPLAY (R30)
83 REQUEST REND PARAM DISPLAY (R31)
84
85 DISPLAY RR LOS AZIMUTH AND ELEVATION
86
87
88
89 REQUEST RENDEZVOUS FINAL ATTITUDE ROUTINE (R63)
90 REQUEST RENDEZVOUS OUT OF PLANE DISPLAY (R30) (NOM AVE G)
91 DISPLAY BANK SUM (P00 ONLY)
92 OPERATE IMU PERFORMANCE TEST (P07)
93 ENABLE W MATRIX INITIALIZATION
94
95 NO UPDATE OF EITHER STATE VECTOR (P20 OR P22)
96 INTERRUPT INTEGRATION AND GO TO P00
97 PERFORM ENGINE FAIL PROCEDURE (R40)
98
99 PLEASE ENABLE ENGINE IGNITION

NOUN CODES

	DATA DISPLAYED	COMPONENTS & SCALING			RESTRICTIONS (SEE CODE)
00					
01	SPECIFY MACHINE ADDRESS (FRACT.)	3 COMP	.XXXXX		
02	SPECIFY MACHINE ADDRESS (WHOLE)	3 COMP	XXXXX.		
03	SPECIFY MACHINE ADDRESS (DEGREES)	3 COMP	XXX.XX	DEG	
04	ANGULAR ERROR/DIFFERENCE	1 COMP	XXX.XX	DEG	
05	ANGULAR ERROR/DIFFERENCE	1 COMP	XXX.XX	DEG	
06	OPTION CODE	3 COMP	OCTAL ONLY		
07	ECADR OF WORD TO BE MODIFIED	3 COMP	OCTAL ONLY		
	ONES FOR BITS TO BE MODIFIED		OCTAL		
	1 TO SET OR 0 TO CLEAR SELECTED BITS		OCTAL		
LOADING NOUN 07 WILL SET OR CLEAR SELECTED BITS IN ANY ERASABLE REGISTER					
08	ALARM DATA	3 COMP	OCTAL ONLY		
09	ALARM CODES	3 COMP	OCTAL ONLY		
10	CHANNEL TO BE SPECIFIED	1 COMP	OCTAL ONLY		
11	TIG OF CSI	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
12	OPTION CODES	2 COMP	OCTAL ONLY		
	(USED BY EXTENDED VERBS ONLY)				
13	TIG OF CDH	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
14	CHECKLIST	3 COMP	XXXXX.		C
	(USED INTERNALLY BY EXTENDED VERBS ONLY) (NOUN 25's PASTED AFTER DISPLAY)				
15	INCREMENT MACHINE ADDRESS	1 COMP	OCTAL ONLY		
16	TIME OF EVENT	3 COMP	00XXX.	HRS	A3
	(USED BY EXTENDED VERBS ONLY)		000XX.	MIN	
			0XX.XX	SEC	
17					
18	AUTO MANEUVER TO FDAI BALL ANGLES	3 COMP	XXX.XX	DEG	
19					
20	PRESENT ICDU ANGLES (Y, P, R) (OG, IG, MG)	3 COMP	XXX.XX	DEG	
21	PIPA PULSES	3 COMP	XXXXX.	PULSES	
			X, Y, Z		
22	DESIRED ICDU ANGLES (Y, P, R) (OG, IG, MG)	3 COMP	XXX.XX	DEG	
23					
24	DELTA TIME FOR LOC CLOCK	3 COMP	00XX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
25	CHECKLIST (USED WITH V99)	3 COMP	XXXXX.		
26	PRIORITY/DELAY, ADRES, BRCON	3 COMP	OCTAL ONLY		
27	SELF TEST ON/OFF SWITCH	1 COMP	XXXXX.		
28					
29					
30					
31					
32	TIME FROM PERIGEE	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
33	TIME OF IGNITION (TIG)	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
34	TIME OF EVENT	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
35	TIME FROM EVENT	3 COMP	00XXX.	HRS	
			000XX.	MIN	
			0XX.XX	SEC	
36	TIME OF LOC CLOCK	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
37	TIG OF TPI	3 COMP	00XXX.	HRS	A3
			000XX.	MIN	
			0XX.XX	SEC	
38	TIME OF STATE VECTOR	3 COMP	00XXX.	HRS	A3
	BEING INTEGRATED		000XX.	MIN	
			0XX.XX	SEC	
39					
40	TIME FROM IGNITION/CUTOFF	3 COMP	XXBXX	MIN/SEC	C
	VG		XXXX.X	FT/SEC	
	DELTA V (ACCUMULATED		XXXX.X	FT/SEC	

NOUN CODES (CONT)

	DATA DISPLAYED	COMPONENTS & SCALING			RESTRICTIONS
41	TARGET AZIMUTH,	2 COMP	XXX.XX	DEG	B
	ELEVATION		XX.XXX	DEG	
42	APOGEE ALTITUDE	3 COMP	XXXX.X	NAUT MI	A
	PERIGEE ALTITUDE		XXXX.X	NAUT MI	
	DELTA V (REQUIRED)		XXXX.X	FT/SEC	
43	LATITUDE (+NORTH),	3 COMP	XXX.XX	DEG	A
	LONGITUDE (+EAST),		XXX.XX	DEG	
	ALTITUDE		XXXX.X	NAUT MI	
44	APOGEE ALTITUDE	3 COMP	XXXX.X	NAUT MI	C
	PERIGEE ALTITUDE		XXXX.X	NAUT MI	
	TFF		XXBXX	MIN/SEC	
45	MARKS,	3 COMP	XXXXX.		C
	TFI OF NEXT/LAST BURN,		XXBXX	MIN/SEC	
	MGA		XXX.XX	DEG	
46	AUTOPILOT CONFIGURATION	1 COMP	OCTAL ONLY		
	CHANNEL BIT FAILURE PROTECTION WORD		OCTAL ONLY		
47	LM WEIGHT	2 COMP	XXXXX.	LBS	A
	CSM WEIGHT		XXXXX.	LBS	
48	GIMBAL PITCH TRIM (+ONLY)	2 COMP	XXX.XX	DEG	A
	GIMBAL ROLL TRIM (+ONLY)		XXX.XX	DEG	
49	DELTA R	3 COMP	XXXX.X	NAUT MI	A
	DELTA V		XXXX.X	FT/SEC	
	RADAR DATA SOURCE CODE		XXXXX		
51	S-BAND ANTENNA ANGLES PITCH,	2 COMP	XXX.XX	DEG	A
	YAW		XXX.XX	DEG	
52	CENTRAL ANGLE OF ACTIVE VEHICLE	1 COMP	XXX.XX	DEG	A
54	RANGE	3 COMP	XXX.XX	NAUT MI	A
	RANGE RATE		XXXX.X	FT/SEC	
	THETA		XXX.XX	DEG	
55	NO. OF APSIDAL CROSSINGS	1 COMP	XXXXX.		A
	ELEVATION ANGLE		XXX.XX	DEG	
	CENTRAL ANGLE OF PASSIVE VEHICLE		XXX.XX	DEG	
56	RR LOS AZIMUTH	2 COMP	XXX.XX	DEG	A
	RR LOS ELEVATION		XXX.XX	DEG	
58	PERIGEE ALTITUDE (POST TPI)	3 COMP	XXXX.X	NAUT MI	A
	DELTA V (TPI)		XXXX.X	FT/SEC	
	DELTA V (TPF)		XXXX.X	FT/SEC	
59	DELTA VEL. LOS - FWD/AFT (+FWD)	3 COMP	XXXX.X	FT/SEC	A
	- RT/LEFT (+RT)				
	- UP/ON (+UP)				
60	FORWARD VELOCITY (+ALWAYS)	3 COMP	XXXX.X	FT/SEC	A
	ALTITUDE RATE (+INCREASING)		XXXX.X	FT/SEC	
	COMPUTED ALTITUDE		XXXXX.	FT	
61	TIME TO GO IN BRAKING PHASE	3 COMP	XXBXX	MIN/SEC	C
	TIME FROM IGNITION		XXBXX	MIN/SEC	
	CROSS RANGE DISTANCE		XXXX.X	NAUT MI	
62	INERTIAL VELOCITY (ABS. VALUE)	3 COMP	XXXX.X	FT/SEC	C
	TIME FROM IGNITION		XXBXX	MIN/SEC	
	DELTA V (ACCUMULATED)		XXXX.X	FT/SEC	
63	LR ALTITUDE MINUS COMPUTED	2 COMP	XXXXX.	FT	
	ALTITUDE RATE		XXXX.X	FT/SEC	A
	COMPUTED ALTITUDE		XXXXX	FT	
64	TIME LEFT FOR REDESIGNATION	2 COMP	XXBXX	SEC-DEG	C
	-LPD ANGLE				
	ALTITUDE RATE (+INCREASING)		XXXX.X	FT/SEC	
	COMPUTED ALTITUDE		XXXXX.	FT	
65	SAMPLED LOC TIME	3 COMP	00XXX.	HR	AB
	(FETCHED IN INTERRUPT)		00XX.	MIN	
			0XX.XX	SEC	
66	LR SLANT RANGE	2 COMP	XXXXX.	FT	C
	LR POSITION		+0000X		
67	LR VX	3 COMP	XXXXX.	FT/SEC	
	LR VY		XXXXX.	FT/SEC	
	LR VZ		XXXXX.	FT/SEC	
68	SM Z-AXIS RANGE TO LANDING SITE	3 COMP	XXXX.X	NAUT MI	C
	TIME TO GO IN BRAKING PHASE		XXBXX	MIN/SEC	
	ABSOLUTE VALUE OF VELOCITY		XXXX.X	FT/SEC	

NOUN CODES (CONT)

	DATA DISPLAYED	COMPONENTS & SCALING			RESTRICTIONS
69	LANDING SITE CORRECTION Z-COMP	2 COMP	XXXXX.	FEET	
	Y-COMP		XXXXX.	FEET	
	X-COMP		XXXXX.	FEET	
70	AOT DETENT CODE/STAR CODE (BEFORE MARK)	2 COMP	OCTAL ONLY 00XXX		B
71	AOT DETENT CODE/STAR CODE (AFTER MARK)	2 COMP	OCTAL ONLY 00XXX		B
72	RR 800 - TRUNNION ANGLE	2 COMP	XXX.XX	DEG	
	RR SHAFT ANGLE		XXX.		
73	NEW RR800 - TRUNNION ANGLE	2 COMP	XXX.XX	DEG	
	NEW RR SHAFT ANGLE		XXX.XX	DEG	
74	TIME FROM IGNITION	2 COMP	XXBXX	MIN/SEC	C
	YAW AFTER VEHICLE RISE		XXX.XX	DEG	
	PITCH AFTER VEHICLE RISE		XXX.XX	DEG	
75	DELTA ALTITUDE CDH	2 COMP	XXXX.X	NAUT MI	C
	DELTA TIME (CDH - CSI OR TPI - CDH		XXBXX	MIN/SEC	
	DELTA TIME (TPI - CDH OR TPI - NOMTPI)		XXBXX	MIN/SEC	
76	DESIRED HORIZ. VEL.	2 COMP	XXXX.X	FT/SEC	
	DESIRED RAD. VEL.		XXXX.X	FT/SEC	
	CROSS-RANGE DIST.		XXXX.X	NAUT MI	
77	TIME TO ENGINE CUTOFF	2 COMP	XXBXX	MIN/SEC	C
	VGY (BODY)		XXXX.X	FT/SEC	
	ABSOLUTE VALE OF VELOCITY		XXXX.X	FT/SEC	
78	RR RANGE	2 COMP	XXX.XX	NAUT/MI	
	RR RANGE RATE		XXXX.X	FT/SEC	
	TIME FROM IGNITION		XXBXX	MIN/SEC	
79	CURSOR ANGLE	2 COMP	XXX.XX	DEG	A
	SPIRAL ANGLE		XXX.XX	DEG	
	POSITION CODE		XXXXX,		
80	DATA INDICATOR	2 COMP	XXXXX.		
	OMEGA		XXX.XX	DEG	
81	DELTA V (LV) ---(+FWD), (+RT), (+DN)	3 COMP	XXXX.X	FT/SEC	A
82	DELTA V (LV) ---(+FWD), (+RT), (+DN)	3 COMP	XXXX.X	FT/SEC X, Y, Z	A
83	DELTA V (BODY) ---(+UP), (+RT), (+FWD)	3 COMP	XXXX.X	FT/SEC X, Y, Z	A A
84	DELTA V (OTHER VEH)	3 COMP	XXXX.X	FT/SEC X, Y, Z	A
85	VG (BODY) ---(+UP), (+RT), (+FWD)	3 COMP	XXXX.X	FT/SEC X, Y, Z	A
86	VG (LV) ---(+FWD), (+RT), (+DN)	3 COMP	XXXX.X	FT/SEC X, Y, Z	A
87	BACKUP OPTICS LOS AZIMUTH (+RT)	2 COMP	XXX.XX	DEG	
	BACKUP OPTICS LOS ELEVATION (+UP)		XXX.XX	DEG	
88	HALF UNIT SUN OR PLANET VECTOR	3 COMP	.XXXXX	(X, Y, Z)	A
89	LANDMARK LATITUDE (+NORTH)	3 COMP	XX.XXX	DEG	A
	LONGITUDE/2 (+EAST)		XX.XXX	DEG	
	ALTITUDE		XXX.XX	NAUT MI	
90	Y	3 COMP	XXX.XX	NAUT MI	A
	Y DOT		XXXX.X	FT/SEC	
	PSI		XXX.XX	DEG	
91	ALTITUDE	2 COMP	XXXXB,	NAUT MI	
	VELOCITY		XXXXX.	FT/SEC	
	FLIGHT PATH ANGLE		XXX.XX	DEG	
92	DESIRED THRUST PERCENTAGE (OF 10,500 LBS - DPS RATED)	3 COMP	XXXXX.	%	
	ALTITUDE RATE (+INCREASING)		XXXX.X	FT/SEC	
	COMPUTED ALTITUDE		XXXXX.	FT	
93	DELTA GYRO ANGLES	3 COMP	XX.XXX	DEG X, Y, Z	

NOUN CODES (CONT)

	DATA DISPLAYED	COMPONENTS & SCALING			RESTRICTIONS
84	VGX (BODY)	3 COMP	XXXX.X	FT/SEC	C
	ALTITUDE RATE		XXXX.X	FT/SEC	
	COMPUTED ALTITUDE		XXXXX.	FEET	
85	SPARE				
86	SPARE				
87	SYSTEM TEST INPUTS	3 COMP	XXXXX.		
88	SYSTEM TEST RESULTS AND INPUTS	5 COMP	XXXXX.		
			.XXXXX		
			XXXXX.		
89	WMATRIX RMS ERROR IN POSITION	3 COMP	XXX.XX	FEET	A
	RMS ERROR IN VELOCITY		XXXX.X	FT/SEC	
	RMS IN BIAS		XX.XXX	RADIANS	

RESTRICTION CODE -

A	DECIMAL ONLY	C	NO LOAD DECIMAL ONLY
B	OCTAL ONLY	D	NO LOAD OCTAL ONLY
A3	DECIMAL ONLY MUST LOAD 3 COMPONENTS	E	SYSTEM TEST ONLY

NOUN STORAGE REGISTER NAMES

CODE	REGISTER(S)
00	
01	(SPECIFY ADDRESS)
02	(SPECIFY ADDRESS)
03	(SPECIFY ADDRESS)
04	DSPTEM1
05	DSPTEM1
06	OPTION2, +1
07	XREG, YREG, ZREG
08	ALMCADR, +1, +2
09	FAILREG, +1, +2
10	(SPECIFY CHANNEL)
11	TCSI, +1
12	OPTION1, +1
13	TCDH, +1
14	DSPTEM1, +1, +2
15	(INCREMENT ADDRESS)
16	DSPTEM1, +1, +2
17	
18	FDAI, Y, Z
19	
20	CDUX, Y, Z
21	PIPAX, Y, Z
22	THETAD, +1, +2
23	
24	DSPTEM1+1, +2
25	DSPTEM1, +1, +2
26	DSPTEM1, +1, +2
27	RMODE
28	
29	
30	
31	
32	-TPER, +1
33	TIG, +1
34	DSPTEM1, +1
35	TTOGO, +1
36	TIME2, TIME1
37	TTPI, +1
38	TET, +1
39	
40	TTOGO
	VGDISP
	DVTOTAL
41	DSPTEM1, +1
42	HAPO
	HPER
	VGDISP
43	LAT
	LONG
	ALT
44	HAPOX
	HPERX
	TFF
45	TRKMKCNT
	TTOGO
	+MGA
46	DAPDATR1
	CHANBKUP
47	LEMMASS
	CSMMASS
48	PITTIME
	ROLLTIME
49	R22DISP
	R22DISP+2
	WHICHREAD
50	
51	ALPHARR
	BETARR
52	ACTCENT
54	RANGE
	RRATE
	RTHETA
56	HN
	ELEV
	CENTANG
58	RR-AZ
	RR-ELEV

CODE	REGISTER(S)
57	
58	PCRTTP1
	DELVTPI
	DELVTPF
59	DV LOS, +1, +2
60	FORVEL
	HDOT DISP
	HCALC1
61	TTFDISP
	TTOGO
	OUT OF PLN
62	ABVEL
	TTOGO
	DVTOTAL
63	DELTAH
	HDOTDISP
	HCALC1
64	FUNNYDSP
	HDOTDISP
	HCALC
65	SAMPTIME, +1
66	RSTACK+2
	CHANNEL 33
67	RSTACK, +1, +2
68	RANGE DSP
	TTFDISP
	ABVEL
69	DLANDX
	DLANDY
	DLANDX
70	AOTCODE, +1, +2
71	AOTCODE, +1, +2
72	CDUT
	CDUS
73	TANG, +1
74	TTOGO
	YAW
	PITCH
75	DIFFALT
	T1TOT2
	T2TOT3
76	ZDOTD
	HDOTD
	XRANGE
77	TTOGO
	VGBODY+2
	ABVEL
78	DNRRANGE
	DNRRDOT
	TTOTO
79	CURSOR
	SPIRAL
	FORCODE
80	DATAGOOD
	OMEGAD
81	DELVLVC, +2, +4
82	DELVLVC, +2, +4
83	DELVIMU, +2, +4
84	DELVOV, +2, +4
85	VGBODY, +2, +4
86	DELVLVC, +2, +4
87	AZ
	EL
88	RTARAD, +2, +4
89	LANDLAT
	LANDLONG
	LANDALT
90	RANGE
	RRATE
	RTHETA
91	P21ALT
	P21VEL
	P21GAM

CODE	REGISTER(S)
92	THRDISP
	HDOTDISP
	HCALC1
93	OGC, +1, +2
94	VGBODY
95	HDOTDISP
96	HCALC
97	
98	
99	DSPTEM1, +1, +2
100	DSPTEM2, +1, +2
101	WWPOS
	WWVEL
	WWBIAS

CHECKLIST CODES

(Used with V33N22)

R1 CODE		ACTION TO BE EFFECTED
00013	KEY IN	NOMINAL OR GYRO COARSE ALIGN (P52)
00014	PROCEED	DO FINE ALIGNMENT ROUTINE (R51, P52, P57)
	ENTER	BYPASS FINE ALIGN ROUTINE (P52) OR, DO LANDING SITE DETERMINATION (P57 OPTION 2)
00016	PERFORM	CELESTIAL BODY ACQUISITION (R51, P51)
00314	PROCEED	DO IMU ALIGN WITH NON-REJECTED DATA (R51, P51)
00002	SWITCH	LGC POWER DOWN (P00)
00201	SWITCH	RR MODE SWITCH TO LGC (P20, P22, R04)
00253	SWITCH	GUIDE CONTROL TO PGNCS, MODE TO AUTO, THROTTLE CONTROL TO AUTO (P12, P40, P71) (P40, P63, P70)
00256	PERFORM	MANUAL ACQUISITION OF RR (R62)
00600	SWITCH	LR ANTENNA TO POSITION 1 (P63)

NOTE: SWITCH DENOTES: CHANGE POSITION OF A CONSOLE SWITCH.
PERFORM DENOTES: START OR END OF A TASK.
KEY IN: DENOTES KEY IN OF DATA THRU THE DSKY.

OPTION CODES

THE SPECIFIED OPTION CODES WILL BE IN COMPONENT R1 IN CONJUNCTION WITH FLASHING V04 N06 OR V04 N13 (FOR EXTENDED VERBS) TO REQUEST THE ASTRONAUT TO LOAD INTO COMPONENT R2 THE OPTION HE DESIRES.

R_1 OPTION CODE	PURPOSE	INPUT FOR R2
00001	SPECIFY IMU ORIENTATION	1 = PREF, 2 = NOM 3 = REFSMMAT, 4 = LANDSITE (P02)
00002	SPECIFY VEHICLE	1 = THIS 2 = OTHER (P21, R30)
00003	SPECIFY TRACKING ATTITUDE	1 = PREFERRED, 2 = OTHER (R53)
00004	SPECIFY RADAR	1 = RR 2 = LR (R04)
00005	SPECIFY RR COARSE ALIGN OPTION	1 = LOCKON 2 = CONTINUOUS DESIGNATE (V41 N72)
00010	SPECIFY ALIGNMENT MODE	0 = ANYTIME 1 = REFSMMAT+G (P57) 2 = TWO BODIES 3 = ONE BODY + G
00015	SPECIFY CSM ORBIT ORBIT OPTION	1 = NO ORBIT CHANGE 2 = CHANGE ORBIT TO PASS OVER LM (P32)

ALARM CODES

CODE		TYPE	SET BY
00111		MARK MISSING	AOTMARK
00112		MARK OR MARK REJECT NOT BEING ACCEPTED	AOTMARK
00113		NO INBITS	AOTMARK
00116		NO MARKS IN LAST PAIR TO REJECT	AOTMARK
00206		ZERO ENCODE NOT ALLOWED WITH COARSE ALIGN + GIMBAL LOCK	IMU MODE SWITCHING
00207		IMU TURNON REQUEST NOT PRESENT FOR 30 SEC	T4RUPT
00210		IMU NOT OPERATING	IMU MODE SW IMU/2, R02, P21, P07
00211		COARSE ALIGN ERROR	IMU MODE SWITCH
00212		PIPA FAIL BUT PIPA IS NOT BEING USED	IMU MODE SWITCH, T4RUPT
00213		IMU NOT OPERATING WITH TURN-ON REQUEST	T4RUPT
00214		PROGRAM USING IMU WHEN TURNED OFF	T4RUPT
00217		BAD RETURN FROM STALL ROUTINES	P61, P63, P67
00220		BAD REFSMMAT	R47, R02
00401		DESIRED GIMBAL ANGLES YIELD GIMBAL LOCK	INF, ALION, IMU/2
00402		FINDCDW NOT CONTROLLING ATTITUDE	FINDCDUW
00404		TWO STARS NOT AVAILABLE IN ANY DETENT	R50, LUNAR SURFACE
00405		TWO STARS NOT AVAILABLE	P52
00421		W-MATRIX OVERFLOW	INTEGRV
00501	P	RADAR ANTENNA OUT OF LIMITS	R03
00502		BAD RADAR GIMBAL ANGLE INPUT	V41N72
00503	P	RADAR ANTENNA DESIGNATE FAIL	R21, NON-P IN V41 N72
00510		RADAR AUTO DISCRETE NOT PRESENT	R25
00511		LR NOT IN POSITION 2 OR REPOSITIONING	SERVICER
00514	P	RR GOES OUT OF AUTO MODE WHILE IN USE	P20
00515		RR CDU FAIL DISCRETE PRESENT	R25
00520		RADARUPT NOT EXPECTED AT THIS TIME	RADAR READ
00522		LR POSITION CHANGE	RADAR READ
00523	P	LR ANTENNA FAIL TO ACHIEVE POSITION 2	SERVICER, V60 NON-P IN V59)
00525	P	DELTA THETA GREATER THAN 2 DEGREES	R22
00526	P	RANGE GREATER THAN 400 NAUTICAL MILES	P20, P22
00527	P	LOS NOT IN MODE 2 COVERAGE WHILE ON LUNAR SURFACE OR VEHICLE MANEUVER REQUIRED	R21, R24 R24 (20)
00530	P	LOS NOT IN MODE 2 COVERAGE ON LUNAR SURFACE AFTER 600 SECS	R21
00600		IMAGINARY ROOTS ON FIRST ITERATION	P32, P72
00601		PERIGEE ALTITUDE CSI LT PMIN 1	P32, P72
00602		PERIGEE ALTITUDE CDH LT PMIN 2	P32, P72
00603		CSI TO CDH TIME LT TMIN13	P32, P72, P33, P73
00604		CDH TO TPI TIME LT TMIN 23 OR COMPUTED CDH TIME GREATER THAN INPUT TPI TIME	P32, P72
00605		NUMBER OF ITERATIONS EXCEEDS LOOP MAXIMUM	P32, P72
00606		DV EXCEEDS MAXIMUM	P32, P72
00611		NO TIG FOR GIVEN ELEV ANGLE	P34, P74
00701		ILLEGAL OPTION CODE SELECTED	P37
00777		PIPA FAIL CAUSED THE 2RS WARNING	T4RUPT
01102		LGC SELF TEST ERROR	SELF CHECK
01105		DOWNLINK TOO FAST	T4RUPT
01106		UPLINK TOO FAST	T4RUPT
01107		PHASE TABLE FAILURE, ASSUME ERASABLE MEMORY IS SUSPECT	RESTART
01301		ARCSIN-ARCOS ARGUMENT TOO LARGE	INTERPRETER
01426		BAD RETURN FROM ROOTFIND	DESCENT GUIDANCE
01427		VG INCREASING (ACCUMULATED DELTAV OF 30 DEGREES AWAY FROM DESIRED THRUST VECTOR)	EGS, (P63) R61, 6
01430		UNINTENTIONAL OVERFLOW IN GUIDANCE	DESCENT EQNS
01432		DESCENT IGNITION ALGORITHM NOT CONVERGING	P63
01600		DSKY, THROTTLING BETWEEN SKIPPED THROTS	P66
01620		V37 REQUEST NOT PERMITTED AT THIS TIME	V37
01800		OVERFLOW IN DRIFT TEST	IMU 4
01801		BAD IMU TORQUE	OPT PREALIGN CALIB IMU 4 (LEM)
01702		IGNITION TIME SLIPPED	MIDTOAVE
01708		INCORRECT PROGRAM REQUESTED FOR VEHICLE CONFIGURATION	P40, P42

ALARM CODES (CONT)

CODE	TYPE	BIT BY
[illegible]	JET FAILURES HAVE DISABLED Y-S TRANSLATION	DAP
[illegible]	JET FAILURES HAVE DISABLED X TRANSLATION	DAP
[illegible]	JET FAILURES HAVE DISABLED P ROTATION	DAP
[illegible]	JET FAILURES HAVE DISABLED U-V ROTATION	DAP
[illegible]	ICDU FAIL CAUSED THE RS WARNING	T4RUPT
[illegible]	ICDU, PIPA FAILS CAUSED THE RS WARNING	T4RUPT
[illegible]	IMU FAIL CAUSED THE RS WARNING	T4RUPT
[illegible]	IMU, PIPA FAILS CAUSED THE RS WARNING	T4RUPT
[illegible]	IMU, ICDU FAILS CAUSED THE RS WARNING	T4RUPT
[illegible]	IMU, ICDU, PIPA FAILS CAUSED THE RS WARNING	T4RUPT
[illegible]	AOTMARK SYSTEM IN USE	AOTMARK
[illegible]	ACCELERATION OVERFLOW IN INTEGRATION	[illegible]
[illegible]	NO SOLUTION FROM TIME THETA OR TIME 6ADOT	[illegible]
21100	UNUSED CCS BRANCH EXECUTED	ABORT
21204	WAITLST, VARDELAY, FIXDELAY, OR LONGCALL CALLED WITH ZERO OR NEGATIVE DELTA-TIME	[illegible]
[illegible]	NOVAC CALLED WITH NEGATIVE ARGUMENT	[illegible]
[illegible]	BAD RETURN FROM ROOTFIND	[illegible]
[illegible]	KEYBOARD AND DISPLAY ALARM DURING	[illegible]
[illegible]	INTERNAL USE (NBSUB)	[illegible]
[illegible]	[illegible]	ABEC
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	SECOND JOB ATTEMPTS TO GO TO SLEEP	PINBA
[illegible]	NO VAC AREA FOR MARKS	[illegible]
[illegible]	TWO PROGRAMS USING DEVICE AT SAME TIME	[illegible]
[illegible]	ILLEGAL INTERRUPT OR EXTENDED VERB	AOTMARK
[illegible]	TWO PRIO DISPLAYS WAITING	DSP INTERFACE
[illegible]	DAP STILL IN PROGRESS AT NEXT T3RUPT	DAP

V06N06E	FAIL REQ CALL
R1 XXXXX	(FIRST ALARM TO OCCUR AFTER LAST RESET)
R2 XXXXX	(SECOND ALARM TO OCCUR AFTER LAST RESET)
R3 XXXXX	(ALARM WHICH OCCURRED LAST)

LGC PROGRAMS AND MAJOR ROUTINES

NUMBER	TITLE
SERVICE	
P00	LGC IDLING
P06	POWER DOWN
P07	SYSTEM TEST (NON-FLIGHT)
ASCENT	
P12	POWERED ASCENT GUIDANCE
COAST	
P20	RENDEZVOUS NAVIGATION
P21	GROUND TRACK DETERMINATION
P22	BR LUNAR SURFACE NAVIGATION
P23	PREFERRED TRACKING ATTITUDE
P27	LGC UPDATE
PRETHRUSTING	
P30	EXTERNAL DELTA V
P32	CO-ELLIPTIC SEQUENCE INITIATION (CSI)
P33	CONSTANT DELTA ALTITUDE (CDH)
P34	TRANSFER PHASE INITIATION (TPI)
P35	TRANSFER PHASE MIDCOURSE (TPM)
THRUST	
P40	DPS THRUSTING
P41	RCS THRUSTING
P42	APS THRUSTING
P47	THRUST MONITOR
ALIGNMENT	
P51	IMU ORIENTATION DETERMINATION
P52	IMU REALIGN
P57	LUNAR SURFACE ALIGNMENT
DESCENT & LANDING	
P63	LANDING MANEUVER BRAKING PHASE
P64	LANDING MANEUVER: APPROACH PHASE
P65	RATE OF DESCENT LANDING (ROD)
P66	LANDING CONFIRMATION

LGC PROGRAMS AND MAJOR ROUTINES (CONT)

TARGET DELTA V

CSM TARGET DELTA V

DH/LR SELF TEST

S BAND ANTENNA

R10/R11/R12 SERVICE

DPS/APS THRUST FAIL

STATE VECTOR

AGS INITIALIZATION

COARSE ALIGN

INFLIGHT FINE ALIGN

LGC PROGRAMS AND MAJOR ROUTINES (CONT)

NUMBER	TITLE
R54	SIGHTING DATA DISPLAY
R55	GYRO TORQUING
R56	TERMINATE TRACKING
R57	MARKRUPT
R58	CELESTIAL BODY DEFINITION
R59	LUNAR SURFACE SIGHTING MARK
R60	ATTITUDE MANEUVER
R61	PREFERRED TRACKING ATTITUDE
R62	CREW DEFINED MANEUVER
R63	RENDEZVOUS FINAL ALTITUDE
R64	FDAI PREFERRED TRACKING ATTITUDE
R70	EXTENDED VERB INTERLOCK
R77	LR SPURIOUS TEST

FLAGWORD BITS - ALPHABETICAL LIST

ABTTGFLG	0*				
ACCOMFLG	0*				
ACC4-2FL	0*				
ACMODFLG	0*				
ALTSCALE	0*				
ANTENFLG	0*				
AORBSFLG	0*				
AORBTFLG	0*				
APSSEW	0*				
APSFLAG	0*				
ASTNFLAG	0*				
ATTFLAG	0*				
AUTOMODE	0*				
AUTR1FLG	0*				
AUTR2FLG	0*				
AUXFLAG	0*				
AVEOFLAG	0*				
AVEWINDW	0*				
AVFLAG	0*				
CALCMAN1	0*				
CALCMAN2	0*				
CDUFLAG	0*				
CMOONFLG	0*				
COGAFLAG	0*				
CONTRLFL	0*				
DAUXFLG	0*				
DAULTFLAG	0*				
DBSELFLG	0*				
DBSL2FLG	0*				
DESIGFLG	0*				
DIDFLAG	0*				
DIMOFLAG	0*				MID1FLAG 0*
DMENFLG	0*				MMOVFLAG 0*
DRIFTOFL	0*				MOONFLAG 0*
DRIFTFLG	0*				MRKIDFLG 0*
DSKYFLAG	0*				MSCNFLG 0*
DSPBFLG	0*				MSUFTFLG 0*
EXCONFLG	0*				MUKFLAG 0*
GRADFLAG	0*				MWAITFLG 0*
KYPIFLAG	0*				NEEDLFLG 0*
[illegible]	0*				NEED2FLG 0*
[illegible]	0*				NEWIFLG 0*
[illegible]	0*				NEXTBFLG 0*
[illegible]	0*				[illegible] 0*
[illegible]	0*				[illegible] 0*
[illegible]	0*				[illegible] 0*
[illegible]	0*				[illegible] 0*
[illegible]	0*				[illegible] 0*
[illegible]	0*				[illegible] 0*

FLAGWORD BITS – ALPHABETICAL LIST (CONT)

MORMON	B4	FW5
MOTERFLG	B11	FW1
MOTHROTL	B12	FW5
MOUPFLAG	B0	FW1
MPONCNFL	B1	FW10
MRMNVFLG	B0	FW4
MRMSDFLG	B13	FW4
MRUPTFLG	B4	FW4
MTARGFLG	B3	FW4
MWAITFLG	B10	FW4
ORBWFLAG	B4	FW3
ORDERNW	B6	FW9
OURROFLG	B12	FW13
PDRFFLAG	B14	FW3
PFRATFLG	B4	FW2
PHSERFLG	B4	FW4
POOMFLAG	B15	FW3
PRECIFLG	B4	FW3
PRODFLG	B14	FW4
PRONVFLG	B7	FW4
PSTHIGAT	B13	FW11
PULSEFLG	B10	FW13
P31FLAG	B11	FW0
P34FLAG	B9	FW9
P44PROFL	B1	FW9
PTRTIFLG	B13	FW9
QUITFLAG	B0	FW1
RCNUFAIL	B7	FW11
RCOOOFLG	B15	FW11
REDFLAG	B0	FW0
REFEMFLG	B13	FW1
REINTFLG	B7	FW10
REMODFLG	B14	FW10
RENDWFLG	B1	FW5
REPOSMON	B11	FW12
RHCSCFLG	B1	FW13
RNDVZFLG	B7	FW9
RNGEDATA	B4	FW11
RNGSCFLG	B10	FW5
ROOFLAG	B13	FW1
ROTFLAG	B4	FW0
RPQFLAG	B15	FW9

RRDATAFL	B4	FW12
RRORNW	B0	FW9
RRREFLAG	B3	FW12
RVSW	B0	FW7
R04FLAG	B0	FW3
R10FLAG	B3	FW4
R12XDFLG	B3	FW11
R40FLAG	B10	FW1
R77FLAG	B11	FW6
SLOPENW	B7	FW1
SNUFFER	B13	FW5
SOLNRW	B3	FW5
SRCHOPTN	B14	FW3
STATEFLG	B0	FW3
STEERNW	B11	FW3
SURFFLAG	B4	FW9
SWANDEP	B11	FW7
S32.1F1	B15	FW5
S34.1F8	B14	FW5
S32.1F3A	B13	FW5
S33.1F3B	B13	FW9
TFTBW	B1	FW7
TRACKFLG	B5	FW1
TURNONFL	B1	FW12
ULLAGFLG	B0	FW13
UPDATFLG	B7	FW1
UPLOCKFL	B4	FW7
UNDQRFLG	B14	FW13
VEHUPFLG	B0	FW1
VELDATA	B5	FW11
VERIFLAG	B3	FW7
VFAILFLG	B14	FW11
VFLAG	B10	FW3
VFLSHYLG	B1	FW11
VINTFLAG	B3	FW3
VXINH	B13	FW11
V37FLAG	B6	FW7
V47FLAG	B4	FW7
V82EMFLG	B3	FW7
XDELVFLG	B3	FW3
XDSPFLAG	B1	FW4
XORFLG	B9	FW13
XOVINFLG	B6	FW10
ZOOMFLAG	B0	FW1
3AXBFLG	B4	FW3
3ORW	B1	FW9

FLAGWORD 0

(LOC. 0014)

	BIT	SET	CLEAR
[illegible]	14	DISPLAY R&P RATES ON FDAI NEEDLES	DISPLAY ATT. ERRORS (SEE BIT 4)
[illegible]	13	INTEGRATION OF W MATRIX	INTEGRATION OF STATE VECTOR
MIDFLAG	12	INTEGRATION WITH SECONDARY BODY AND SOLAR PERTURBATIONS	INTEGRATION WITHOUT SOLAR PERTURBATIONS
[illegible]	11	MOON IS SPHERE OF INFLUENCE	EARTH IS SPHERE OF [illegible]
[illegible]	10	USE BASE VECTORS [illegible]	USE PAD [illegible] BASE VECTORS
[illegible]	9	[illegible]	[illegible]
[illegible]	8	[illegible]	PROJECT OPERATION
[illegible]	7	[illegible]	[illegible]
[illegible]	6	[illegible]	[illegible] (RADAR NOT IN USE)
[illegible]	5	RADAR TARGET IN [illegible]	RADAR TARGET IN SM COORDINATES
[illegible]	4	[illegible]	[illegible]
[illegible]	3	TOTAL ATTITUDE ERROR DISPLAYED	[illegible]
[illegible]	2	USED BY P51-53 TEMPORARY IN MANY ROUTINES AND BY LUNAR AND SOLAR EPHEMERIDES	
[illegible]	1	R10 OUTPUTS DATA TO ALTITUDE & ALTITUDE RATE METERS ONLY	[illegible]
[illegible]	0	[illegible]	[illegible]

FLAGWORD 1

(LOC. 0173)

	BIT	SET	CLEAR
NJETSFLG	16	TWO JET RCS BURN	FOUR JET RCS BURN
DIDFLAG	14	INERTIAL DATA IS AVAILABLE	PERFORM DATA DISPLAY INITIALIZATION FUNCTION
ERADFLAG	13	COMPUTE REARTH FISCHER ELLIPSOID	USE CONSTANT REARTH PAD RADIUS
REDFLAG	12	IF IN P66, NORMAL OPERATION CONTINUES RESTART CLEANS FLAG	IF IN P66, REINITIALIZATION IS PERFORMED
ROTERFLG	11	TERRAIN MODEL INHIBITED	TERRAIN MODEL PERMITTED
R61FLAG	10	RUN R61 LEM	RUN R61 LEM
SPARE	9		
VEHUPFLG	8	CSM STATE VECTOR BEING UPDATED	LM STATE VECTOR BEING UPDATED
UPDATFLG	7	UPDATING BY MARKS ALLOWED	UPDATING BY MARKS NOT ALLOWED
NOUPFLAG	6	NEITHER CSM NOR LM STATE VECTOR MAY BE UPDATED	EITHER STATE VECTOR MAY BE UPDATED
TRACKFLG	5	TRACKING ALLOWED	TRACKING NOT ALLOWED
PRFTOVF	4	FIRST TIME THROUGH PREPOSITION	NOT FIRST TIME THROUGH PREPOSITION
SLOPESW	3	ITERATE WITH SIAM METHOD IN ITERATOR	ITERATOR WITH REGULAR FALSI METHOD IN ITERATOR
QUERYF	2	NO STARTING VALUE FOR ITERATION EXISTS	STARTING VALUE FOR ITERATION EXISTS
SPARE	1		

FLAGWORD 2

NAME	BIT	SET	CLEAR
DBGTFLG	15	TORQUE CALLS GYRO COMPENSATION	TORQUE CALLS GYRO COMPENSATION
RNDZOPTK	14	RADAR IN AUTOMATIC SEARCH OPTION (R21)	RADAR NOT IN AUTOMATIC SEARCH OPTION
AOSCOPLG	13	MANUAL ACQUISITION BY RENDEZVOUS RADAR	AUTO ACQUISITION BY RENDEZVOUS RADAR
LOSCMFLG	12	LINE OF SIGHT BEING COMPUTED (R61)	LINE OF SIGHT NOT BEING COMPUTED
[illegible]	11	[illegible]	[illegible]
[illegible]	10	[illegible]	[illegible]
[illegible]	9	[illegible]	[illegible]
[illegible]	8	[illegible]	[illegible]
[illegible]	7	[illegible]	TPI TIME SUPPLIED FOR P34, P74 TO COMPUTE ELEVATION
[illegible]	6	[illegible]	[illegible]
[illegible]	5	[illegible]	[illegible]
[illegible]	4	PREFERRED ATTITUDE COMPUTED	[illegible]
[illegible]	3	[illegible]	[illegible]
[illegible]	2	[illegible]	[illegible]
[illegible]	1	[illegible]	[illegible]

FLAGWORD 3

(LOC: 0377)

NAME	BIT	SET	CLEAR
NOBKFLAG	15	INHIBIT BACKWARD INTEGRATION	ALLOW BACKWARD INTEGRATION
GLOKFAIL	14	GIMBAL LOCK HAS OCCURRED	NOT IN GIMBAL LOCK
REFSMFLG	13	REFSMMAT GOOD	REFSMMAT NO GOOD
LUNAFLAG	12	LUNAR LAT-LONG	EARTH LAT-LONG
NODOFLAG	11	SYSTEM TESTS NOT ALLOWED	SYSTEM TESTS ALLOWED
VFLAG	10	LESS THAN TWO STARS IN FIELD OF VIEW	TWO STARS IN FIELD OF VIEW
R30FLAG	9	ALARM 521 SUPPRESSED	ALARM 521 ALLOWED
PRECIFLG	8	NORMAL INTEGRATION IN P40	ENGAGES 4-TIME STEP (P40) LOGIC IN INTEGRATION
CULTYFLAG	7	STAR OCCULTED	STAR NOT OCCULTED
ORBWFLAG	6	W MATRIX VALID FOR ORBITAL NAVIGATION	W MATRIX INVALID FOR ORBITAL NAVIGATION
STATEFLG	5	PERMANENT STATE VECTOR UPDATED	PERMANENT STATE VECTOR NOT UPDATED
INTYPFLG	4	CONIC INTEGRATION	ENCKE INTEGRATION
VINTFLAG	3	CSM STATE VECTOR BEING INTEGRATED	LM STATE VECTOR BEING INTEGRATED
DIMOFLG	2	DIMENSION OF W IS 6 FOR INTEGRATION	DIMENSION OF W IS 6 FOR INTEGRATION
DOMOFLAG	1	W MATRIX IS TO BE USED	W MATRIX IS NOT TO BE USED

FLAGWORD 4

NAME	BIT	SET	CLEAR
[illegible]	15	[illegible]	[illegible]
PRIODFLG	14	PRIORITY DISPLAY IN ENDIDLE	NO PRIORITY DISPLAY IN ENDIDLE
NRMDFLG	13	NORMAL DISPLAY IN ENDIDLE	NO NORMAL DISPLAY IN ENDIDLE
SPARE	12		
NWAITFLG	11	HIGHER PRIORITY DISPLAY OPERATING WHEN MARK DISPLAY [illegible]	[illegible] AY OPERATING WHEN MARK [illegible]SPLAY [illegible]TED
[illegible]	10	HIGHER PRIORITY DISPLAY OPERATING WHEN NORMAL DISPLAY INITIATED	[illegible]
[illegible]	9	ASTRONAUT USING KEYBOARD WHEN MARK DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN MARK [illegible] INITIATED
[illegible]	8	ASTRONAUT USING KEYBOARD WHEN NORMAL DISPLAY INITIATED	[illegible]
[illegible]	7	ASTRONAUT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED	ASTRONAUT NOT USING KEYBOARD WHEN PRIORITY DISPLAY INITIATED
[illegible]	6	ASTRONAUT HAS INTERFERED WITH EXISTING DISPLAY	[illegible]
[illegible]	5	[illegible]	[illegible] DISPLAY NOT [illegible] PTED BY [illegible]
[illegible]	4	[illegible] AT INTERRUPTED BY PRIORITY OR MARK [illegible]	[illegible] PRIORITY OR MARK [illegible]
[illegible]	3	[illegible] NORMAL	[illegible]
SPARE	2		
[illegible]	1	MARK DISPLAY NOT TO BE INTERRUPTED	[illegible]

FLAGWORD 5

(LOC. 0161)

NAME	BIT	SET	CLEAR
DSKYFLAG	15	DISPLAYS SENT TO DSKY	NO DISPLAYS TO DSKY
PDSPFLAG	14	R64 DOES PRIORITY DISPLAY AND IS RESTART PROTECTED	R60 DOES NORMAL DISPLAY AND IS NOT RESTORED
DKEYFLAG	13	U, V, JETS DISABLED DURING DPS BURNS (V48)	U, V, JETS ENABLED DURING DPS BURNS (V78)
NOTHROTL	12	INHIBIT FULL THROTTLE	PERMIT FULL THROTTLE
RTFLAG	11	RT IS ON, SUPPRESS ALL RADAR ALARMS AND TRACKER FAILS	RT IS NOT ON
RSCSFLG	10	SCALE CHANGE HAS OCCURRED DURING RR READING	NO SCALE CHANGE HAS OCCURRED DURING RR READING
DMPFLG	9	DIMENSION OF W IS 6 FOR INCORPORATION	DIMENSION OF W IS 4 FOR INCORPORATION
TOONFLAG	8	THROTTLE UP HAS OCCURRED IN P63	THROTTLE UP HAS NOT YET OCCURRED IN P63
ENGONFLG	7	ENGINE TURNED ON	ENGINE TURNED OFF
3AXISFLG	6	MANEUVER SPECIFIED BY THREE AXES	MANEUVER SPECIFIED BY ONE AXIS - R60 CALLS VECPOINT
AOSQFLG	5	P-AXIS COUPLES RSA, AIP OR A3R, B1L PREFERRED	P-AXIS COUPLES A4R, B2L OR B4Y, A1A PREFERRED
RONRSW	4	BYPASS RR GIMBAL MONITOR	PERFORM RR GIMBAL MONITOR
SOLNSW	3	LAMBERT DOES NOT CONVERGE, OR TIME-RAD NEARLY CIRCULAR	LAMBERT CONVERGES OR TIME-RADIUS NON-CIRCULAR
MOLVFLAG	2	LOCAL VERTICAL CO-ORDINATES COMPUTED	MIDDLE GIMBAL ANGLE COMPUTED
RENDWFLG	1	W MATRIX VALID FOR RENDEZVOUS NAVIGATION	W MATRIX INVALID FOR RENDEZVOUS NAVIGATION

FLAGWORD 6

(LOC. 0130)

NAME	BIT	SET	CLEAR
DELTAVFLG	15	DELTA V AT CSI TIME ONE EXCEEDS MAX	
[illegible]	14	FIRST PASS OF NEWTON ITERATION	[illegible]
[illegible]	13	BIT 13 AND BIT 12 FUNCTION AS AN ORDERED PAIR (13,12) INDICATING THE POSSIBLE OCCURRENCE OF 2 NEWTON ITERATIONS FOR S3B. IN THE PROGRAM IN THE FOLLOWING ORDER. (0,1) (I.E. BIT 13 NOT SET BIT 12 SET) = FIRST NEWTON ITERATION BEING DONE (0,0) = FIRST PASS OF NEWTON ITERATION (1,1) = S0 FT/SEC STAGE OF SECOND NEWTON ITERATION (1,0) = REMAINDER OF NEWTON ITERATION.	
[illegible]	12	SUCCEEDING PASS	[illegible]
[illegible]	11	CROSSING OVER	[illegible]
[illegible]	10	[illegible]	[illegible]
[illegible]	9	[illegible]	[illegible]
[illegible]	8	[illegible]	[illegible]
[illegible]	7	[illegible]	[illegible]
[illegible]	6	[illegible]	[illegible]
[illegible]	5	[illegible]	[illegible]
[illegible]	4	[illegible]	[illegible]
[illegible]	3	ASTRONAUT DID OVERWRITE DELV OR TPM (P34, P35)	[illegible]
[illegible]	2	P30 [illegible] WILL EXERCISE DVMON ON ITS [illegible]	DVMON WILL BE [illegible] ON ITS NEXT PASS EVEN IF IDLEFLAG IS NOT SET. IT [illegible]
[illegible]	1	[illegible]	[illegible]

FLAGWORD 7

(LOC. [illegible])

NAME	BIT	SET	CLEAR
[illegible]	15	P34-TPI TIME TO BE COMPUTED	TPI HAS BEEN COMPUTED
MANUFLAG	14	ATTITUDE MANEUVER DOING DURING RR SEARCH	NO ATTITUDE MANEUVER DURING RR SEARCH
IGNFLAG	13	TIG HAS ARRIVED	TIG HAS NOT ARRIVED
ASTNFLAG	12	ASTRONAUT HAS OKAYED IGNITION	ASTRONAUT HAS NOT OKAYED IGNITION
SWANDISP	11	LANDING ANALOG DISPLAYS ENABLED	LANDING ANALOG DISPLAYS SUPPRESSED
NORMSW	10	UNIT NORMAL INPUT TO LAMBERT	LAMBERT COMPUTES ITS OWN UNIT NORMAL
SVSW	9	DO NOT COMPUTE FINAL STATE VECTOR IN TIME THETA	COMPUTE FINAL STATE VECTOR IN TIME-THETA
VETFLAG	8	ASTRONAUT OVERWRITE W-MATRIX INITIAL VALUES	ASTRONAUT DOES NOT OVERWRITE W-MATRIX INITIAL VALUES
IDLEFLAG	7	NO DV MONITOR	CONNECT DV MONITOR
VBTFLAG	6	AVERAGE G (SERVICER) RUNNING	AVERAGE G (SERVICER) OFF
AVEGFLAG	5	AVERAGE G (SERVICER) DESIRED	AVERAGE G (SERVICER) NOT DESIRED
UPLOCKFL	4	R-KBAR-K FAIL	NO R-KBAR-K FAIL
VERIFLAG	3	CHANGED WHEN VERB OCCURS	AT END OF P37
VBEMPLG	2	MOON VICINITY	EARTH VICINITY
TPFSW	1	CALCULATE TPERIGEE	CALCULATE TPF

FLAGWORD 8

(LOC. 0100)

NAME	BIT	SET	CLEAR
RPQFLAG	15	RPQ NOT COMPUTED RPQ=VECTOR BETWEEN SECONDARY BODY AND PRIMARY BODY	RPQ COMPUTED
SPARE	14		
NEWSVFLG	13	FIRST PASS THROUGH INTEGRATION	SUCCEEDING ITERATION OF INTEGRATION
CMOONFLG	12	PERMANENT CSM STATE IN LUNAR SPHERE	PERMANENT CSM STATE IN EARTH SPHERE
LMOONFLG	11	PERMANENT LM STATE IN LUNAR SPHERE	PERMANENT LM STATE IN EARTH SPHERE
FLUNDISP	10	CURRENT GUIDANCE DISPLAYS INHIBITED	CURRENT GUIDANCE DISPLAYS PERMITTED
SPARE	9		
SURFFLAG	8	LM ON LUNAR SURFACE	LM NOT ON LUNAR SURFACE
INFINFLG	7	NO CONIC SOLUTION (CLOSURE THROUGH INFINITY REQUIRED)	CONIC SOLUTION EXISTS
ORDERSW	6	ITERATOR USES 2ND ORDER MINIMUM MODE	ITERATOR USES 1ST ORDER STANDARD MODE
APSESW	5	R DESIRED OUTSIDE PERICENTER-APOCENTER RANGE IN TIME-RADIUS	R DESIRED INSIDE PERICENTER-APOCENTER RANGE IN TIME-RADIUS
CUSPFLAG	4	NO CONIC SOLUTION-TOO CLOSE TO RECTILINEAR (CUSP OVERFLOW)	CONIC SOLUTION EXISTS (CUSP DOES NOT OVERFLOW)
SPARE	3		
INITALON	2	INITIAL PASS THRU PAT	SECOND PASS THRU PAT
360SW	1	TRANSFER ANGLE NEAR 360 DEGREES	TRANSFER ANGLE NOT NEAR 360 DEGREES

FLAGWORD 9

(LOC. 0100)

NAME	BIT	SET	CLEAR
SPARE	15		
FLVR	14	VERTICAL RBE (ASCENT GUIDANCE)	NON-VERTICAL RBE
P70T1FLG	13	P70 OR P71 IS USING ASCENT GUIDANCE	P15 IS USING ASCENT GUIDANCE EQUATIONS
FLPC	12	NO POSITION CONTROL (ASCENT GUIDANCE)	POSITION CONTROL
FLPI	11	PRE-IGNITION PHASE (ASCENT GUIDANCE)	REGULAR GUIDANCE
FLRCS	10	RCS INJECTION MODE (ASCENT GUIDANCE)	MAIN ENGINE MODE
LETABORT	9	ABORT PROGRAMS ARE ENABLED	ABORT PROGRAMS ARE NOT ENABLED
FLAP	8	APS CONTINUED ABORT AFTER DPS STAGING (ASCENT GUIDANCE)	APS ABORT IS NOT A CONTINUATION
ABTTOFLG	7	J3, K1 PARAMETERS USED FOR ABORT TARGETING	J1, K1 PARAMETERS USED FOR ABORT TARGETING
ROTFLAG	6	P70 AND P71 WILL FORCE VEHICLE ROTATION IN PREFERRED DIRECTION	P70 AND P71 WILL NOT FORCE VEHICLE ROTATION IN THE PREFERRED DIRECTION
QUITFLAG	5	DISCONTINUE INTEGR	CONTINUE INTEGRATION
FLT50FLG	4	LUNAR SURFACE PROCEDURE USED	NORMAL MARKS TO BE USED DURING INFLITE ALGN
MID1FLG	3	INTEGRATE TO TDEC	INTEGRATE TO THE THEN-PRESENT TIME
MIDAVFLG	2	INTEGRATION ENTERED FROM ONE OF MIDTOAV PORTALS	INTEGRATION WAS NOT ENTERED VIA MIDTOAV
AVEMIDSW	1	AVETOMID CALLING FOR W MATRIX INTEGR	NO AVETOMID W. INTEGR ALLOW SET UP RN, VN, PIPTIME

FLAGWORD 10

(LOC [illegible])

NAME	BIT	SET	CLEAR
SPARE	15		
INTFLAG	14	INTEGRATION IN PROGRESS	INTEGRATION NOT IN PROGRESS
APSFLAG	13	ASCENT STAGE	DESCENT STAGE
SPARE	12		
SPARE	11		
SPARE	10		
SPARE	9		
SPARE	8		
RESTFLG	7	INTEGRATION ROUTINE TO BE RESTARTED	INTEGRATION ROUTINE NOT TO BE RESTARTED
SPARE	6		
SPARE	5		
SPARE	4		
SPARE	3		
CONTRLFL	2	DAP CONTROLLING VEHICLE ATTITUDE	DAP NOT CONTROLLING VEHICLE ATTITUDE
RPHSCHDT	1	LAST ACTIVE DAP PASS DONE WITH AN ACR INDICATION.	LAST ACTIVE PASS DONE WITH A FORCE INDICATION

FLAGWORD II

(LOC. 0157)

NAME	BIT	SET	CLEAR
LRBYPASS	15	BYPASS ALL LANDING RADAR UPDATES (R12)	DO NOT BYPASS LANDING RADAR UPDATES
VFAILFLG	14	LANDING RADAR VEL FAILED REASONABLE TEST	LANDING RADAR VEL PASSED REASONABLE TEST
RFAILFLG	13	LANDING RADAR ALT FAILED REASONABLE TEST	LANDING RADAR ALT PASSED REASONABLE TEST
VXSW	12	(R12) IF X VELOCITY DATA UNREASONABLE BY-PASS X VELOCITY TEST FOR DATA ON NEXT PASS	UPDATE X AXIS VELOCITY
NOTVHAT	11	PART UPDATE	FULL UPDATE
NOLRREAD	10	(R12) LANDING RADAR REPOSITIONING BY-PASS UPDATE	LR NOT REPOSITIONING
RONEFLG	9	(R12) BELOW LIMIT, INHIBIT X AXIS OVERRIDE	ABOVE LIMIT, DO NOT INHIBIT X AXIS OVERRIDE
LRINH	8	LANDING RADAR UPDATES PERMITTED BY ASTRONAUT	LANDING RADAR UPDATES INHIBITED BY ASTRONAUT
VELDATA	7	(R12) LR VELOCITY MEASUREMENT MADE	LR VELOCITY MEASUREMENT NOT MADE
SPARE	6		
SPARE	5		
RNGDATA	4	(R12) LR ALTITUDE MEASUREMENT MADE	LR ALTITUDE MEASUREMENT NOT MADE
R12RDFLG	3	WAIT UNTIL ALL VEL READS DONE BEFORE R12 PROCESSING	ALLOW R12 PROCESSING OF VEL DATA, LR VEL READ DONE
VFLSHFLG	2	LR VELOCITY FAIL LAMP SHOULD BE FLASHING (R12)	LR VELOCITY FAIL LAMP SHOULD NOT BE FLASHING
RFLSHFLG	1	LR ALTITUDE FAIL LAMP SHOULD BE FLASHING (R12)	LR ALTITUDE FAIL LAMP SHOULD NOT BE FLASHING

FLAGWORD 12 (RADMODES)

		(LSB. 0)	
		SET	CLEAR
CREEPLAG	-0	CONTINUOUS DESIGNATE, LOC COMMANDS RR REGARDLESS OF LOCK-ON	LOC DECMS FOR LOCK-ON WHEN ANTENNA BEING DESIGNATED
	-1	CHANGE IN ANTENNA MODE HAS BEEN REQUESTED I.E. REMODE	
	-2		
	-3		
	-4	REPOSITION MONITOR, RR REPOSITION IS TAKING PLACE	
	-5	RR DESIGNATE RE-	RR DESIGN- QUESTE
	-6	LR ALTITUDE READING IS ON HIGH SCALE	
	-7		
	-8		
	-9		
	-10		
	-11	-FULLY	
	-12	RR DATA FAIL/ DATA CO NOT BE READ	
	-13	SCALE	RR THE
	-14	RR NOT IN AUTO MODE. AUTO MODE DISCRETE IS NOT PRESENT.	RR IN AUTO MODE
	-15	RR TURN-ON SEQUENCE IS S. (ZERO CDUS.	NO RR TURN-ON SEQUENCE IN PROGRESS

FLAGWORD 13 (DAPBOOLS)

(LOC. 0111)

NAME	BIT	SET	CLEAR
PULSEFLG (PULSED)	15	MINIMUM IMPULSE COMMAND MODE, IN ATTITUDE HOLD (V76)	NOT IN MINIMUM IMPULSE COMMAND MODE (V77)
USEQRFLG (USEQRJTB)	14	GIMBAL UNUSABLE USE JETS ONLY	TRIM GIMBAL MAY BE USED
CSMDKFLG (CSMDOCKD)	13	CSM DOCKED, USE BACKUP DAP	CSM NOT DOCKED TO LM
OURRCFLG (OURACBIT)	12	CURRENT DAP PASS IS RATE COMMAND	CURRENT DAP PASS IS NOT RATE COMMAND
ACC4-1FL (ACC4OREX)	11	4 JET X-AXIS TRANSLATION REQUESTED	2 JET X-AXIS TRANSLATION REQUESTED
AORBTFLG (AORBTRAN)	10	B-SYSTEM FOR X-TRANSLATION	A-SYSTEM FOR X-TRANSLATION (PREFERRED)
XOVINFLG (XOVINHIB)	9	X-AXIS OVERRIDE LOCKED OUT	X-AXIS OVERRIDE ONLY
DRIFTFL (DRIFTBIT)	8	ASSUME ZERO OFFSET DRIFTING FLIGHT	USE OFFSET ACCELERATION ESTIMATE
RHCSCFLG (RHCSCALE)	7	NORMAL RHC SCALING REQUESTED	FINE RHC SCALING REQUESTED
ULLAGFLG (ULLAGEN)	6	ULLAGE REQUESTED BY MISSION PROGRAM	NO INTERNAL ULLAGE REQUESTED
DB1LFLG	5	5 DEG. DB SELECTED BY CREW	1.0 OR 0.2 DEG. DB SELECTED BY CREW
DB0LFLG (DB0LECT)	4	MAXIMUM DEADBAND SELECTED BY CREW (1.0 DEGREES)	MINIMUM DEADBAND SELECTED BY CREW (0.2 DEGREES)
ACCOKFLG (ACCSOKAY)	3	CONTROL AUTHORITY VALUES FROM 1/ACCS USABLE	RESTART OR FRESH START SINCE LAST 1/ACCS OUTPUTS SUSPECT
AUTR1FLG (AUTORATE R	2	THESE FLAGS ARE USED TOGETHER TO INDICATE ASTRONAUT CHOSEN KALCMANU MANEUVER RATES (0, 0) = (BIT 2, BIT 1) = 0.2 DEG/SEC (0, 1) = 0.5 DEG/SEC	
AUTR1FLG (AUTRATE 1)	1	(1, 0) = 2.0 DEG/SEC (1, 1) = 10.0 DEG/SEC	

LOCATION RCSFLAGS

(FLAGS INTERNAL TO DAP)

NAME	BIT	SET	CLEAR
YZTACK	1	FIRST LEG OF TACKING PATTERN FOR Y OR Z TRANSLATION WITH A JET FAILURE.	SECOND LEG OF TACKING PATTERN.
DACFLAG1	2	ENABLE IMU ERROR COUNTERS. DAC'S HAVE BEEN ZEROED. USED IN CONJUNCTION WITH BIT 3 IN ATTITUDE-ERROR DISPLAY ROUTINE.	COUNTERS PRESUMED OK.
DACFLAG2	3	IMU ERROR COUNTERS SHOULD BE DISABLED IN ORDER TO ZERO DAC'S. USED IN CONJUNCTION WITH BIT 2 IN ATTITUDE-ERROR DISPLAY ROUTINE.	COUNTERS PRESUMED OK.
DSPLYALT	4	DISPLAY ATTITUDE ERRORS.	COMPUTE TOTAL ATTITUDE ERRORS WHEN NEEDED.
CALLGMBL	5	REQUESTS SETTING OF GIMBAL-DRIVE BITS IN CHANNEL 12 (I.E., PERFORM ACDT + C12).	DO NOT SET GIMBAL DRIVE BITS IN CHANNEL 12 (I.E. DO NOT PERFORM ACDT + C12).
	6,7,9	NOT USED	
JUSTIN	8	RHC STICK OUT OF DETENT ON LAST PASS.	RHC STICK NOT OUT OF DETENT ON LAST PASS.
PDIT	10	DIRECT RATE MODE OF MANUAL RATE COMMAND REQUIRED IN P AXIS.	DIRECT RATE NOT REQUIRED IN P AXIS.
QDRT	11	DIRECT RATE MODE OF MANUAL RATE COMMAND REQUIRED IN Q, R AXES.	DIRECT RATE NOT REQUIRED IN Q, R AXES.
SKIPP	12	PERFORM CONTROL OF P AXIS IN NEXT PASS.	SKIP CONTROL OF P AXIS IN NEXT PASS.
ACCSET	13	A JOB TO DO 1/ACCS HAS BEEN SET UP SINCE THE LAST FRESH START OR RESTART.	SET UP A JOB IN DAPIDLER TO DO 1/ACCS
	14,15	NOT USED	

MISC. DAPFLAGS

NAME	SET	CLEAR
ALLOWGTS	THRUST OFFSET SMALL ENOUGH TO USE GTS FOR ATTITUDE CONTROL.	THRUST OFFSET TOO LARGE TO USE GTS FOR ATTITUDE CONTROL.
SKIPU SKIPV	EXERCISE CONTROL FOR INDICATED "AXIS"	SKIP CONTROL FOR INDICATED "AXIS"
COTROLER	INDICATOR OF CONTROL SYSTEM EMPLOYED IN CURRENT DAP PASS = 0 INDICATES GTS: LM-ALONE CASE. > 0 INDICATES GTS: CSM-DOCKED CASE. < 0 INDICATES RCS.	
GNOTS	GTS PRESENTLY CONTROLLING ATTITUDE.	RCS PRESENTLY CONTROLLING ATTITUDE.

NORTH
RIGHT ASCENSION
DECLINATION
EAST
WEST
SOUTH

STAR / PLANET LIST

OCTAL STAR CODE	NAME	VIS MAG.	RIGHT ASCENSION (HR. MIN.)	DECLINATION (DEG. MIN.)
1	ALPHA ANDROMEDAE (ALPHERATZ)	2.1	0	+28
2	BETA CET (DIPHDA)	2.2	0	-18
3	GAMMA CASSIOPEIAE (NAVI)	2.2	0	+60
4	ALPHA ERIDANI (ACHERNAR)	0.6	1	-57
5	ALPHA URSAE MINORIS (POLARIS)	2.1	1	+89
6	THETA ERIDANI (ACAMAR)	3.2	1	-40
7	ALPHA CETI (MENKAR)	2.8	3	+4
10	ALPHA PERSEI (MIRFAK)	1.8	3	+49
14	ALPHA TAURI (ALDEBARAN)	1.1	4	+16
15	BETA ORIONIS (RIGEL)	0.3	5	-8
17	ALPHA AURIGAE (CAPELLA)	0.2	5	+45
20	ALPHA CARINAE (CANOPUS)	-0.9	6	-53
21	ALPHA CANIS MAJORIS (SIRIUS)	-1.6	6	-16
22	ALPHA CANIS MINORIS (PROCYON)	0.5	7	+5
27	GAMMA VELORUM (REGOR)	1.9	8	-47
30	IOTA URSAE MAJORIS (DUBHE)	2.1	8	+62
31	ALPHA HYDRAE (ALPHARD)	2.2	9	-8
32	ALPHA LEONIS (REGULUS)	1.3	10	+12
33	BETA LEONIS (DENEBOLA)	2.2	11	+15
34	GAMMA CORVI (GIENAH)	2.6	12	-17
35	ALPHA CRUCIS (ACRUX)	1.6	12	-63
36	ALPHA VIRGINIS (SPICA)	1.2	13	-11
37	ETA URSAE MAJORIS (ALKAID)	1.9	13	+49
39	THETA CENTAURI (MENKENT)	2.2	14	-36
41	ALPHA BOOTIS (ARCTURUS)	0.2	14	+19
42	ALPHA CORONAE BOREALIS (ALPHECCA)	2.2	15	+27
43	ALPHA SCORPII (ANTARES)	1.2	16	-26
45	ALPHA TRIANGULI AUSTR. (ATRIA)	1.9	16	-69
46	ALPHA OPHIUCHI (RASALHAGUE)	2.1	17	+12
48	ALPHA LYRAE (VEGA)	0.1	18	+38
49	SIGMA SAGITTARII (NUNKI)	2.1	18	-26
50	ALPHA AQUILAE (ALTAIR)	0.9	19	+8
51	BETA CAPRICORNI (DABIH)	3.2	20	-15
52	ALPHA PAVONIS (PEACOCK)	2.1	20	-57
53	ALPHA CYGNI (DENEB)	1.3	20	+45
54	EPSILON PEGASI (ENIF)	2.5	21	+10
55	ALPHA PISCIS AUSTRINUS (FOMALHAUT)	1.9	22	-30
60	SUN			
67	EARTH			
68	MOON			
69	PLANET			

STAR	NO.	STAR	NO.	STAR	NO.
ACAMAR	6	CANOPUS	20	MIRFAK	10
ACHERNAR	4	CAPELLA	17	NAVI	3
ACRUX	35	DABIH	51	NUNKI	49
ALDEBARAN	14	DENEB	53	PEACOCK	52
ALKAID	37	DENEBOLA	33	PROCYON	22
ALPHARD	31	DIPHDA	2	POLARIS	5
ALPHECCA	42	DUBHE	30	RASALHAGUE	46
ALPHERATZ	1	ENIF	54	REGOR	27
ALTAIR	50	FOMALHAUT	55	REGULUS	32
ANTARES	43	GIENAH	34	RIGEL	15
ARCTURUS	41	MENKAR	7	SIRIUS	21
ATRIA	45	MENKENT	39	SPICA	36
				VEGA	48

LGC COUNTER INTERRUPTS

LGC MEMORY LOCATION (COUNTER)	NAME	REMARKS	SCALE	RANGE
0024	TIME 1	STORES MOST SIGNIFICANT TIME WORD	INCREMENTS EACH 163.84 SEC	OVERFLOWS EACH 31D, 1H, 30M, 14.56S
0025	TIME 2	STORES LEAST SIGNIFICANT TIME WORD	INCREMENTS EACH 0.01 SEC	OVERFLOWS EACH 163.84 SEC
0026	TIME 3	TIME COUNTER FOR T-3RUPT	INCREMENTED EACH 10 MS	
0027	TIME 4	TIME COUNTER FOR T-4RUPT	INCREMENTED EACH 10 MS	
0030	TIME 5	TIME COUNTER FOR REACTION CONTROL	INCREMENTED EACH 10 MS	
0031	TIME 6	TIME COUNTER FOR REACTION CONTROL	DECREMENTED 9.765 MS	
0032	CDU X	COUNTS ±Δθ PULSES FROM X INERTIAL CDU	38.16 SEC/ COUNT	±180°
0033	CDU Y	COUNTS ±Δθ PULSES FROM Y INERTIAL CDU	38.16 SEC/ COUNT	±180°
0034	CDU Z	COUNTS ±Δθ PULSES FROM Z INERTIAL CDU	38.16 SEC/ COUNT	±180°
0035	CDU T	COUNTS ±Δθ PULSES FROM RADAR TRUNNION CDU	38.16 SEC/ COUNT	± 76°
0036	CDU S	COUNTS ±Δθ PULSES FROM RADAR SHAFT CDU	38.16 SEC/ COUNT	±180°
0037	PIPA X	COUNTS ±Δθ PULSES FROM X PIPA	1.9 CM/SEC/ COUNT	±16383
0040	PIPA Y	COUNTS ±Δθ PULSES FROM Y PIPA	1.9 CM/SEC/ COUNT	±16383 CM/SEC
0041	PIPA Z	COUNTS ±Δθ PULSES FROM Z PIPA	1.9 CM/SEC/ COUNT	±16383 CM/SEC
0042	Q-RHCCTR	COUNTS PITCH ±Δθ PULSES FROM RHC	3.02 COUNTS/ DEG	±11°
0043	P-RHCCTR	COUNTS YAW ±Δθ PULSES FROM RHC	3.02 COUNTS/ DEG	±11°
0044	R-RHCCTR	COUNTS ROLL ±Δθ PULSES FROM RHC	3.02 COUNTS/ DEG	±11°
0045	DNLINK	CONVERTS SERIAL UPLINK DATA INTO PARALLEL INFORMATION		
0046	RNRAD	CONVERTS SERIAL RADAR DATA INTO PARALLEL INFORMATION		
0047	GYROCMD	OUTPUT PULSES TO SELECTED GYRO	.006 SEC/ COUNT	±4.5°
0050	CDUXCMD	OUTPUT PULSES TO X (OUTER) CDU	156.3 SEC/ COUNT	±10.08°
0051	CDUYCMD	OUTPUT PULSES TO Y (INNER) CDU	156.3 SEC/ COUNT	±10.08°
0052	CDUZCMD	OUTPUT PULSES TO Z (MIDDLE) CDU	156.3 SEC/ COUNT	±10.08°
0053	CDUTCMD	OUTPUT PULSES TO TRUNNION CDU	38.16 SEC/ COUNT .0687 PPS/ COUNT	±10.08° ±800 PPS

LGC COUNTER INTERRUPTS (CONT)

LGC MEMORY LOCATION (COUNTER)	NAME	REMARKS	SCALE	RANGE
0004	COUNCDU	OUTPUT PULSES TO SHAFT CDU	156.3 SEC/ COUNT .3067 FPS/ COUNT	± 36.56° ± 200 PPS
0005	THRUST	THRUST DRIVE FOR METER DISPLAY AND ENGINE CONTROL	9 LBS/COUNT	9450 LBS
0006	ALTM	OUTPUT PULSES TO ATTITUDE AND ALTITUDE RATE METERS	3.048 FT/ COUNT 6.0 FPS/ COUNT	0-65000 FT ± 600 FPS

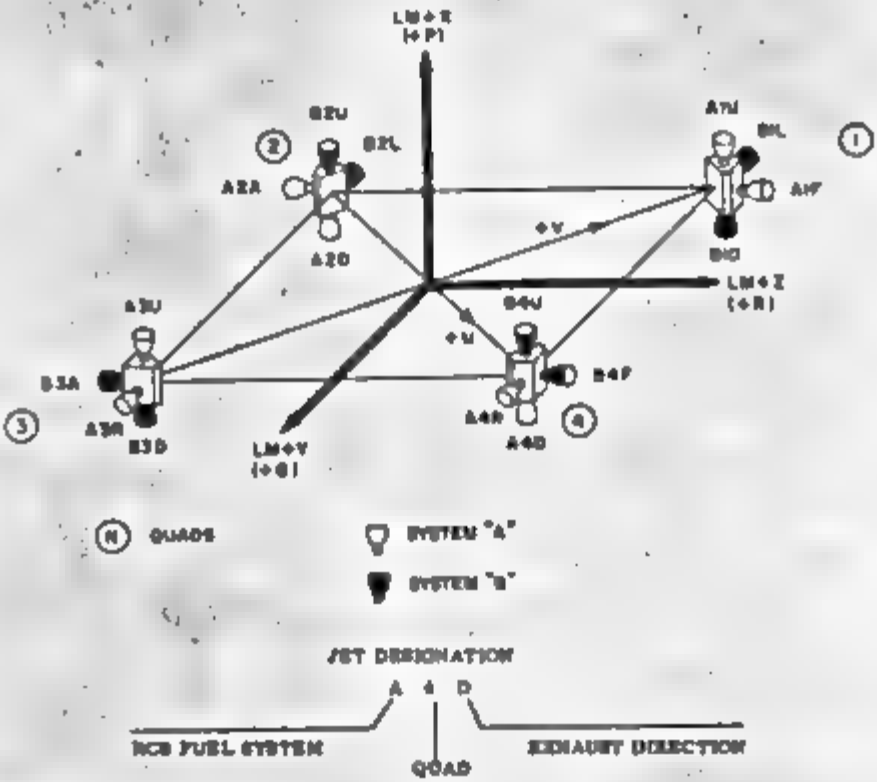
CHANNEL 14 GYRO SELECT

BITS	4	5	7	GYRO	8	9	7	GYRO
	0	0	0	-	1	0	0	-
	0	0	1	-X	1	0	1	-X
	0	1	0	-Y	1	1	0	-Y
	0	1	1	-Z	1	1	1	-Z

CHANNEL 13 RADAR DATA SELECT

A	B	C	FUNCTION	A	B	C	FUNCTION
0	0	0	NONE	1	0	0	LR X VELOCITY
0	0	1	RR RANGE	1	0	1	LR Y VELOCITY
0	1	0	RR RANGE RATE	1	1	0	LR Z VELOCITY
0	1	1	NONE	1	1	1	LR RANGE

LM RCS JET CONTROL AXES



The P, Q & R axis designations are used with rotations and the X, Y & Z designations are used with translations. U & V are used with both.

The astronaut can disable jets on each QUAD only in pairs and according to RCS fuel systems.

LM DAP JET SELECTION — ROTATION

+YAW

1. A4R - B1L - A1F - B3A
2. A1F - B3A
3. A4R - B1L
4. A4R - B3A
5. B1L - B3A
6. B1L - A1F
7. A4R - A1F

-YAW

1. B1L - A3R - A3A - B4F
2. B1L - A3R
3. A3A - B4F
4. A3R - A3A
5. B1L - A3A
6. B1L - B4F
7. A3R - B4F

+ ROLL

(+V) +(U)

B4U - A3D — B1D - A3U
B4U — B1D
A4D — A3U

- ROLL

(-V) -(U)

B3U - A4D — A1U - B2D
B3U — B2D
A4D — A1U

+PITCH

(-V) (+U)

B2U - A4D — B1D - A3D
B2U — B1D
A4D — A3U

-PITCH

(+V) -(U)

B4U - A3D — A1D - B2D
B4U — B2D
A3D — A1U

*For Roll & Pitch, a combination of the U-V jets will be operated.

LM DAP JET SELECTION — TRANSLATION

(X-POLICY SELECTED BY DAP LOAD)

+X

1. B1D - B2D - A4D - A3D
2. B1D - B2D
3. A4D - A3D

-X

1. A1U - A3U - B3U - B4U
2. B3U - B4U
3. A1U - A3U

+Y

1. B1L - B3L
   B3L - B4F/A3A*
   B1L - A1F/B3A*

-Y

1. A4R - A3R
   A3R - B3A/A1F*
   A4A - B4F/A3A*

+Z

1. B3A - A3A
   B3A - A3R/B1L*
   A3A - B3L/A4R*

-Z

1. A1F - B4F
   B4F - A4R/B3L*
   A1F - B1L/A3R*

*These are alternate translation policies that result in a banking maneuver. Two (the alternate (/) on-off, the third remains on.

LM AUTOPILOT CONFIGURATION DATA (NOUN46)

DAP DATA LOADED INTO COMPONENT R1 UPON REQUEST BY FLAG WORD Vol X46

R1 = ABCDE

VEHICLE CONFIGURATION	X-TRANSLATION JET SELECT	MAX MANUAL MANEUVER RATE (ROTATION)	ATTITUDE DEADBAND	AUTOMATIC MANEUVER RATE (ROTATION)
1 = ASCENT 2 = DESCENT 3 = DOCKED	0 = 2 JET RCS A 1 = 2 JET RCS B 2 = 4 JET RCS A 3 = 4 JET RCS B	0 = 6.0 DEG/SEC 1 = 20.0 DEG/SEC	0 = 60.2 DEG 1 = 61.0 DEG 2 = 66.0 DEG	0 = 0.2 DEG/SEC 1 = 0.5 DEG/SEC 2 = 2.0 DEG/SEC 3 = 10.0 DEG/SEC
DIGIT A	DIGIT B	DIGIT C	DIGIT D	DIGIT E

RADMODES - CH 33 CORRELATION

BIT	RADMODES DESCRIPTION	CHANNEL 33 DESCRIPTION
15	CONTINUOUS DESIGNATE	
14	REMODE	
13	RR ZERO	
12	RR MODE (ANTENNA)	
11	MONITOR REPOSITION	
10	DESIGNATE	
9	LR HIGH SCALE	LR RANGE LOW SCALE
8	LR VELOCITY DATA FAIL	LR VELOCITY DATA GOOD
7	RR CDU FAIL	CHANNEL 33 RR CDU FAIL
6	LR ANTENNA POSITION #2	LR ANTENNA POSITION 1
5	LR POSITION DATA GOOD	LR DATA GOOD
4	RR DATA GOOD	RR DATA GOOD
3	RR HIGH SCALE	RR RANGE LOW SCALE
2	RR AUTO MODE	RR POWER ON/AUTO
1	RR TURN-ON	

IMODES 30 - CH 30 CORRELATION

BIT	IMODES 30 DESCRIPTION	CHANNEL 30 (INV. LOGIC) DESCRIPTION
15	ISS TEMP IN LIMITS	ISS TEMP IN LIMITS
14	ISS TURN ON REQUEST	ISS TURN ON REQUEST
13	IMU FAIL	IMU FAIL
12	ICDU FAIL	ICDU FAIL
11	IMU CAGE	IMU CAGE
10	PIPA FAIL	
9	IMU OPERATING	IMU OPERATE
8	SECOND TURN ON SAMPLE	
7	FIRST TURN ON SAMPLE	
6	IMU BEING INITIALIZED	
5	PIPA FAIL INHIBIT (PROGRAM CAUTION)	
4	IMU FAIL INHIBIT	
3	ICDU FAIL INHIBIT	
2	TURN ON DELAY SEQUENCE FAIL	
1	PIPA FAIL INHIBIT (ISS WARNING)	

IMODES 33 - CH 32 & 33 CORRELATION

BIT	IMODES 33 DESCRIPTION	CHANNELS 32 & 33 (INVERTED LOGIC) CHANNEL DESCRIPTION
14	PROCEED KEY PRESSED	33 PROCEED KEY PRESSED
13	PIPA FAIL	33 PIPA FAIL
12	DOWNLINK TOO FAST	33 DOWNLINK TOO FAST
11	UPLINK TOO FAST	33 UPLINK TOO FAST
8	ENABLE DAP	
1	LAMPTEST IN PROGRESS	

LGC CHANNEL ASSIGNMENTS

BIT 15	BIT 14	BIT 13	BIT 12	BIT 11	BIT 10	BIT 9	BIT 8	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	CHANNEL	
							+14 RCS B1D	+13 RCS A1U	+10 RCS A2D	+9 RCS B2U	+6 RCS B3D	+5 RCS A3U	+2 RCS A4D	+1 RCS B4U	0	
							+16 RCS B1L	+4 RCS A4R	+8 RCS A3R	+12 RCS B2L	+11 RCS A2A	+15 RCS A1F	+3 RCS B4F	+7 RCS B3A	5	
RELAY ADRS 4	RELAY ADRS 3	RELAY ADRS 2	RELAY ADRS 1	RELAY BIT 11	RELAY BIT 10	RELAY BIT 9	RELAY BIT 8	RELAY BIT 7	RELAY BIT 6	RELAY BIT 5	RELAY BIT 4	RELAY BIT 3	RELAY BIT 2	RELAY BIT 1	10	
	ENGINE OFF	ENGINE ON			CAUTION RESET	TEST CONNECTOR OUT		OPERATOR ERROR LAMP	VN FLASH	KEY REL LAMP	TEMP CAUTION LAMP	UPLINK ACTY LAMP	COMPUTER ACTY LAMP	IMU WARNING	11	OUTPUTS
100 TURNON DELAY COMPLETE	RR ENABLE AUTO TRK	LR POS 2 COMMAND	+ROLL GIMBAL TRIM	-ROLL GIMBAL TRIM	+PITCH GIMBAL TRIM	-PITCH GIMBAL TRIM	DISPLAY INERTIAL DATA		ENABLE IMU ERROR COUNTER	ZERO IMU CDU	COARSE ALIGN ENABLE		ENABLE RR ERROR COUNTER	ZERO RRCDU	12	
ENABLE T6RUPT	RESET TRAP 32	RESET TRAP 31B	RESET TRAP 31A	ENABLE STANDBY	TEST ALARMS	RHC READ	ENABLE RHC CTR	DNLNK WD ORD		UNUSED	RADAR ACTY	RADAR a	RADAR b	RADAR c	13	
DRIVE CDUX	DRIVE CDUY	DRIVE CDUZ	DRIVE CDU T	DRIVE CDU S	GYRO ACTY	GYRO MINUS	GYRO s	GYRO t	GYRO ENABLE		THRUST DRIVE	ALT METER	ALT RATE	UNUSED	14	
										KEY 5M	KEY 4M	KEY 3M	KEY 2M	KEY 1M	15	
								DESCENT -	DESCENT +	MARK REJECT	MARK Y	MARK X			16	
TEMP IN LIMITS	RR TURNON REQUEST	IMU FAIL	RCDU FAIL	IMU CAGE	G & N CONT OF S/C	IMU OPER		RRCDU FAIL	DISPLAY INERTIAL DATA REQ	AUTO THROTTLE	ABORT STAGE (APS)	ENGINE ARMED	UNUSED	ABORT (DPS)	30 *	INPUTS
ATT CONTROL OUT OF DETENT	AUTO STABILIZATION	ATT HOLD	-X TRANS	+X TRANS	-Y TRANS	+Y TRANS	-X TRANS	+X TRANS	-AZ (LPD) -RMI	+AZ (LPD) +RMI	-YMI	+YMI	-EL (LPD) -PMI	+EL (LPD) +PMI	31 *	
	PROCEED				APPARENT GIMBAL FAIL	GIMBOFF	T 10-11 FAIL	T 9-12 FAIL	T 13-15 FAIL	T 14-16 FAIL	T 6-1 FAIL	T 1-5 FAIL	T 5-6 FAIL	T 2-4 FAIL	32 *	
CMC ALARM	COMPUTER WARNING	PIPA FAIL	DNLNK TOO FAST	UPLINK TOO FAST	BLOCK UPLINK	LR RANG LO SCALE	LR VEL DAT GOOD	LR POS 2	LR POS 1	LR ALT DAT GOOD	RR DATA GOOD	RR RANGE LO SCALE	RR PWR ON AUTO		33 *	
						SCALAR DOUBLE FREQ	SCALAR FAIL	COUNTER FAIL	VOLTAGE FAIL	NITE WATCHMAN FAIL	BUP1OC FAIL	TC TRAP FAIL	PARITY FAIL E-MEM	PARITY FAIL (BOTH)	77	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1		

BITS WITHIN DARK LINES ARE PCMCIA EXTERNAL INTERFACES

*INVERTED LOGIC

NOTES

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